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INFORMATION REPORT

REPORT

USSR

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Two Shaft Internal Combustion Engines

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SUPPLEMENT TO
REPORT **DATE OF INFORMATION**

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1. Assemblies of engines with two crankshafts and two parallel rows of cylinders instead of U-shaped internal combustion engines came into appearance quite frequently in the USSR. These types of engines are in demand as tractor engines (tank motors), locomotive engines (for trunk-line locomotives) and as marine engines (engines for submarines). 50X1
2. Two-shaft internal combustion engines with a parallel arrangement of two rows of cylinders are assembled with a common distributor shaft for both rows of cylinders (for instance in tractor engines) and also with an independent distributor shaft for each row of cylinders.
3. The design of a tractor two-shaft engine with parallel arrangement of two rows of cylinders with a common distributor shaft is shown in V I Tsvetkov's handbook "Dvigateli Vnutrennego Sgoraniya" (page 31, illustration 29). The design of a locomotive two-shaft engine with parallel arrangement of two rows of cylinders with independent distributor shaft for each row of cylinders is shown in the same hand-book on page 380 illustration 431.
4. Marine (submarine) two-shaft internal combustion engines with a parallel arrangement of two rows of cylinders are usually designed with an independent distributor shaft for each row of cylinders. 50X
5. The design for powerful high-speed two-shaft internal combustion engines with a parallel arrangement of two rows of cylinders has been worked out in the USSR by Soviet specialists. [redacted] the main credit for carrying out this engine design was due the Kolomoyskiy saved. 50
6. The advantages of these engines over the conventional U-shaped engines are discussed in the above-mentioned book by Tsvetkov. These advantages are mainly that the crankshaft and chassis bearings are relieved from the great tension exerted by high-power engines.

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Some Data on the Parameters of the Two-Shaft Engine with Special Arrangement of the Rows of Cylinders. Shown in Figure 1.1. (of 11)

7. In his book Tsvetkov gives some data on the two-shaft engine a sketch of which is shown in illustration 4.11, to wit:

(a) Effective power	$N_e = 2200 \text{ HP}$
(b) Cylinder diameter	$D = 314 \text{ mm}$
(c) Piston stroke	$S = 394 \text{ mm}$
(d) Supercharge pressure	$P_R = 1,365 \text{ kg/cm}^2$
(e) Length of engine	$L = 4,2 \text{ m}$
(f) Width of engine	$B = 1,9 \text{ m}$
(g) Height of engine	$H = 1,9 \text{ m}$

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8. an approximate estimate on the following data of the engine:

(a) Number of revolutions	$= N$
(b) Compression ratio	$= \epsilon$
(c) Pressure at end of compression	$= P_c$
(d) Maximum combustion pressure	$= P_z$
(e) Mechanical coefficient of output	$= \eta_m$
(f) Average indicated pressure	$= P_i$
(g) Average effective pressure	$= P_e$
(h) Indicated fuel consumption	$= g_i$
(i) Effective fuel consumption	$= g_e$

9. According to experimental data on engines designed in this fashion the quantitative equivalents of these values will fluctuate approximately within the following limits:

(a) Compression ratio	$\epsilon = 12 - 13$
(b) Pressure at end of compression	$P_c = 50 - 60 \text{ kg/cm}^2$
(c) Maximum pressure of combustion	$P_z = 60 - 90 \text{ kg/cm}^2$
(d) Mechanical coefficient of output	$\eta_m = 0,80 - 0,90$
(e) Average indicated pressure	$P_i = 9 - 18 \text{ kg/cm}^2$
(f) Average effective pressure	$P_e = 7,5 - 15 \text{ kg/cm}^2$
(g) Indicated fuel consumption	$g_i = 130 - 150 \text{ gram/Indicated HP per hour}$
(h) Effective fuel consumption	$g_e = 170 - 210 \text{ gram/effective HP per hour}$

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the number of revolutions of this engine from the computation formula for the effective power of the engine by taking the value of the average effective pressure within the limits applicable to these types of engines and by the known power of the engine, its cylinder diameter, piston stroke and number of cylinders.

$$N_e = 1.745 D^3 S n P_e Z i$$

$$(a) \text{ For } P_e = 7.5 \text{ kg/cm}^2 \quad n = \frac{2200}{1.745 \times 0.0986 \times 0.394 \times 7.5 \times 0.5 \times 12} = 720 \text{ rev/min}$$

$$(b) \text{ For } P_e = 7.8 \text{ kg/cm}^2 \quad n = \frac{2200}{1.745 \times 0.0986 \times 0.394 \times 7.8 \times 0.5 \times 12} = 695 \text{ rev/min}$$

$$(c) \text{ For } P_e = 7.75 \quad n = 700 \text{ rev/min}$$

In conclusion the following must be noted:

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(a) internal combustion engines for submarines in the USSR were built for 800-1000 revolutions per minute.

(b) Two-shaft internal combustion engines with parallel arrangement of two rows of cylinders on vessels of the merchant fleet were not in demand and, judging from contemporary merchant fleet publications, they are apparently not in demand at this time either.

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Existing Brands of Internal Combustion Marine Engines in the USSR.

10. By government standard "GOST 4393-48" standard brands of internal combustion engines used for installation on vessels as main engines and also as auxiliary engines were approved in the USSR. The following brands of engines are not enumerated in Tsvetkov's handbook:

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(a) 6У - 45/42

Six-cylinder engine, single action with cylinder diameter of 450 mm, piston stroke of 420 mm, 450 rev/min.

(b) 8УН- 43.0/47

Eight-cylinder engine, single action with supercharge; cylinder diameter of 430 mm, piston stroke 470 mm, 470 rev/min.

(c) 4У - 14.5/20.5

Four-cylinder engine, single action, with cylinder diameter of 145 mm, piston stroke 205 mm, 850 revolutions per minute.

(d) 6У - 23/30

Six-cylinder engine, single action, with cylinder diameter of 230 mm, piston stroke 300 mm, 1000 revolutions per minute.

(e) 6У - 13/18

Six-cylinder engine, single action, with cylinder diameter of 130 mm, piston stroke 180 mm, 1500 revolutions per minute.

(f) 6У - 12/18

Six-cylinder engine, single action, with cylinder diameter of 120 mm, piston stroke 180 mm, 1500 revolutions per minute.

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(g) 6U - 10.5/14

Six-cylinder engine, single action, with cylinder diameter of 105 mm,
piston stroke 140 mm, 1800 revolutions per minute.

(h) 12U - 15/18

Twelve-cylinder engine, single action, with cylinder diameter of 150 mm,
piston stroke 180 mm, 1800 revolutions per minute.

(i) 6U - 12.7/15.2

Six-cylinder engine, single action, with cylinder diameter of 127 mm,
piston stroke 152 mm, 2000 revolutions per minute.

(j) D-50

Six-cylinder engine, single action, with cylinder diameter of 318 mm,
piston stroke 330 mm. Effective power of engine 1000 HP, 740 revolutions
per minute.

(k) 3D - 6

Six-cylinder engine, single action, with cylinder diameter of 150 mm,
piston stroke 180 mm. Effective power of engine 150 HP with 1500 revo-
lutions per minute.

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PREPARED AND DISSEMINATED BY CENTRAL INTELLIGENCE AGENCY				REPORT								
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SUBJECT Ranks of Communist Personnel in the Main Administration of the Northern Sea Route				NO. OF PAGES 8								
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General 1. The Main Administration of the Northern Sea Route (Glavsevmorput') was organized . For some time it was a part of the former People's Commissariat of the Merchant Fleet. After World War II this administration was independent and subordinate directly to the Council of Ministers, USSR. At the present time, Glavsevmorput' is part of the Ministry of the Merchant and River Fleet. 2. Since the moment of its organization, Glavsevmorput' has been built almost completely along the lines followed in the Merchant Fleet; ie, in matters of personnel service, personnel ranks, disciplinary regulations, and regulations for shipboard service. 3. At the same time a governmental decree was issued establishing junior, intermediate, senior, and top echelon ranks for the merchant fleet, a similar decree was issued establishing such ranks for the Main Administration of the Northern Sea Route. By this decree, distinguishing insignia, form of dress, the system for appointment to rank, and the system of inter-relationships between official personnel of the Main Administration of the Northern Sea Route were established. 4. In addition to the above, it should be noted that the following were put into effect among the personnel of Glavsevmorput': (a) Regulations on worker's discipline from the merchant transport fleet, USSR; (b) Regulations for service on ships of the merchant fleet, USSR.												
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Ranks for Command Personnel in Glavmorflot'

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5. The decree of the Council of Ministers for command personnel of the Main Administration of the Northern Sea Route established ranks in 14 categories as follows:
 - (a) Junior command personnel -- categories 1, 2, 3, 4
 - (b) Intermediate command personnel -- categories 5, 6, 7
 - (c) Senior command personnel -- categories 8, 9, 10
 - (d) Top echelon command personnel -- categories 11, 12, 13, 14
6. Personnel not having the rank of junior, intermediate, senior, or top echelon command staff, belongs
 - (a) To the category of rank and file personnel
 - (b) To a non-certified group because of insufficient time in service.
7. Command personnel of Glavmorflot' are divided into the following services:
 - (a) Operational
 - (b) Technical
 - (c) Administrative
8. In determining the character of service for this or that worker, the post held by him as well as his speciality are taken into consideration. After that the type of a worker's service is not changed as a rule, even when he is transferred from operational to administrative service for example, unless such a transfer is for disciplinary reasons.
9. The following ranks have been established for command personnel of the Main Administration of the Northern Sea Route. They are in effect at the present time:
 - A. Operational Service
 - (a) Junior command personnel
 - (1) Petty officer (starshina) of the Northern Sea Route, 3rd class,
 - (2) Petty officer of the Northern Sea Route, 2nd class,
 - (3) Petty officer of the Northern Sea Route 1st class,
 - (4) Chief petty officer of the Northern Sea Route.
 - (b) Intermediate command personnel
 - (1) Junior lieutenant of the Northern Sea Route,
 - (2) Lieutenant of the Northern Sea Route,
 - (3) Senior lieutenant of the Northern Sea Route.

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(a) Senior command personnel

- (1) Captain of the Northern Sea Route, 3rd class,
- (2) Captain of the Northern Sea Route, 2nd class,
- (3) Captain of the Northern Sea Route, 1st class.

(4) Sea captain command personnel

- (1) General-director of the Northern Sea Route, 3rd class,
- (2) General-director of the Northern Sea Route, 2nd class,
- (3) General-director of the Northern Sea Route, 1st class,
- (4) General-director of the Northern Sea Route.

B. Technical Service**(a) Junior command personnel**

- (1) Petty officer for technical service of the Northern Sea Route, 3rd class,
- (2) Petty officer for technical service of the Northern Sea Route, 2nd class,
- (3) Petty officer for technical service of the Northern Sea Route, 1st class,
- (4) Chief petty officer for technical service of the Northern Sea Route.

(b) Intermediate command personnel

- (1) Junior lieutenant technician of the Northern Sea Route,
- (2) Lieutenant technician of the Northern Sea Route,
- (3) Senior lieutenant technician of the Northern Sea Route,
- (4) Senior engineer lieutenant of the Northern Sea Route.

(c) Senior command personnel

- (1) Engineer-captain of the Northern Sea Route, 3rd class,
- (2) Engineer-captain of the Northern Sea Route, 2nd class,
- (3) Engineer-captain of the Northern Sea Route, 1st class.

(4) Sea captain command personnel

- (1) Engineer-general-director of the Northern Sea Route, 3rd class,
- (2) Engineer-general-director of the Northern Sea Route, 2nd class,
- (3) Engineer-general-director of the Northern Sea Route, 1st class.

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C. Administrative Service**(a) Junior command personnel**

- (1) Administrative petty officer of the Northern Sea Route, 3rd class,
- (2) Administrative petty officer of the Northern Sea Route, 2nd class,
- (3) Administrative petty officer of the Northern Sea Route, 1st class,
- (4) Administrative chief petty officer of the Northern Sea Route.

(b) Intermediate command personnel

- (1) Junior administrative lieutenant of the Northern Sea Route,
- (2) Administrative lieutenant of the Northern Sea Route,
- (3) Senior administrative lieutenant of the Northern Sea Route.

(c) Senior command personnel

- (1) Administrative major-director of the Northern Sea Route,
- (2) Administrative lieutenant-colonel-director of the Northern Sea Route,
- (3) Administrative colonel-director of the Northern Sea Route.

(d) Top echelon command personnel

- (1) Administrative general-director of the Northern Sea Route, 3rd class,
- (2) Administrative general-director of the Northern Sea Route, 2nd class.

Emblems and Uniforms (for Command Personnel)

9. The distinguishing insignia, emblems, cut and style of dress for the command personnel of the Main Administration of the Northern Sea Route are presently the same as for the merchant fleet. From external appearances it is impossible to distinguish a member of the merchant fleet from a member of the Main Administration of the Northern Sea Route. It should be kept in mind however that considerable numbers of command personnel carry out duties (ship crews, expedition command, wintering stations, meteorological stations, expeditions, etc) which require them to wear special clothing suitable for polar work conditions.
10. It should be noted also that ships assigned to the Main Administration of the Northern Sea Route fly a blue pennant, while airplanes assigned to the administration have a white bear standing on his hind legs painted on the planes' fuselage.

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System of Establishing Ranks

11. The system of appointment and promotions of personnel of the Main Administration of the Northern Sea Route corresponds fully to the system in the merchant fleet. When the Main Administration of the Northern Sea Route, the Ministry of the Merchant Fleet, and the Ministry of the River Fleet were combined into a single Ministry of the Merchant and River Fleet, intermediate and senior ranks were conferred on personnel of the Main Administration of the Northern Sea Route by the chief of this administration, while top echelon appointments were made by governmental decree. At the present time, intermediate and senior ranks are conferred by the Minister of the Merchant and River Fleet Shipping on the recommendation of the chief of the Main Administration of the Northern Sea Route, Shipping.
12. The system for establishing the type of service is the same in the Main Administration of the Northern Sea Route as in the Merchant fleet.
13. The conditions under which a demotion or promotion in rank may occur is the same in the Main Administration of the Northern Sea Route as in the merchant fleet.
14. The system for service in the various ranks is the same in both the Main Administration of the Northern Sea Route and the merchant fleet.
15. The interrelationships between official personnel in the Main Administration of the Northern Sea Route are governed by the same rules and regulations as are in effect in the merchant fleet.
16. Finally, the connection between the Main Administration of the Northern Sea Route and the naval forces is the same as exists between the merchant fleet and the naval forces.

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Illustrative Table of Ranks for the Command Personnel in Various Service Categories of the Main Administration of the Northern Sea Route

17. According to the table of ranks for command personnel in various services, personnel of the Main Administration of the Northern Sea Route may have ranks in the following categories:

(A) Arctic steamship companies

Chiefs, steamship companies	10-11,
Deputy chiefs, steamship companies, and chiefs political divisions	9-10,
Chiefs of leading services and agencies	8-9,
Chiefs of leading divisions and other services	7-8,
Chiefs of other divisions and departments	6-7,
Senior engineers and senior dispatchers	6-8,
Engineers and dispatchers	5-6,
Senior technicians and technicians	4-5,
Senior inspectors and inspectors	5-6,
Senior economists and economists	5-6,
Chief accountants	7-8,
Senior accountants and accountants	5-6,
Secretaries, clerks, head clerks, auditors, senior staff, etc.	3-4.

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(B) Ports, shipping points, trading posts, bases.

Chiefs of ports, shipping points, trading posts, bases _____ 6-10,
 Deputy chiefs _____ 5-9,
 Chiefs of leading divisions, regions, sections _____ 6-8,
 Chiefs of leading divisions _____ 6-7,
 Chiefs of other divisions and departments _____ 5-7,
 Senior engineers, senior dispatchers _____ 5-7,
 Engineers and dispatchers _____ 5-6,
 Senior technicians and technicians _____ 4-5,
 Senior inspectors and inspectors _____ 4-6,
 Senior economists and economists _____ 4-6,
 Chief accountants _____ 6-8,
 Senior accountants and accountants _____ 4-6,
 Senior planners and planners _____ 4-6,
 Senior cargo expeditors and expeditors _____ 4-5,
 Secretaries, clerks, head clerks, senior
 machinists, cargo clerks _____ 1-4.

(C) Plants, shipyards, shops

Directors of plants, shipyards, shops _____ 8-10,
 Deputy directors _____ 7-9,
 Chiefs of leading divisions and shops _____ 6-8,
 Chiefs of other divisions and shops _____ 5-7,
 Senior engineers and senior shop foremen _____ 5-7,
 Engineers and shop foremen _____ 5-6,
 Senior technicians and technicians _____ 4-5,
 Senior inspectors and inspectors _____ 4-6,
 Senior economists and economists _____ 4-6,
 Chief accountants _____ 6-8,
 Senior accountants and accountants _____ 4-6,
 Secretaries, time keepers, head clerks,
 clerks, senior machinists, brigade leaders,
 workers of the 7th category _____ 1-4.

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(D) Associations, trusts, administrations, sections

Chiefs of associations, trusts, administrations, sections _____ 6-10,
 Deputy chiefs _____ 5-9,
 Chiefs of regions, sections, mines _____ 6-8,
 Chiefs of leading divisions _____ 6-7,
 Chiefs of other divisions and departments _____ 5-7,
 Senior engineers, senior superintendents, senior foremen _____ 5-7,
 Engineers, superintendents, foremen _____ 5-6,
 Senior technicians and technicians _____ 4-5,
 Senior economists and economists _____ 4-6,
 Senior inspectors and inspectors _____ 4-6,
 Chief accountants _____ 6-7,
 Senior accountants and accountants _____ 4-6,
 Secretaries, clerks, head clerks, senior machinists, timekeepers _____ 1-4.

(E) Enterprises, stations, conditions

Chiefs _____ 6-9,
 Deputy chiefs _____ 5-8,
 Senior scientific workers _____ 7-8,
 Scientific workers _____ 6-7,
 Senior engineers _____ 7-8,
 Engineers _____ 6-7,
 Senior technicians and technicians _____ 4-5,

(F) Scientific and educational institutions

Directors of the Arctic Institute, chief of the Higher Arctic Sea School _____ 10-11,
 Deputy directors and chief _____ 9-10,
 Chiefs of divisions of the institutes and schools _____ 8-11,
 Professors _____ 10-12,
 Lecturers _____ 8-10,
 Scientific workers _____ 6-8.

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(6) Personnel on ship of the transport and industrial class

Captains of various groups _____ 6-10,
 Chief engineers _____ 9-10,
 Senior engineers _____ 6-9,
 Motor _____ 5-8,
 Engineers and electricians _____ 5-8,
 Chief radio operators _____ 5-7,
 Senior mechanics, senior engineers _____ 2-3,
 Senior cooks, senior helmsmen _____ 2-3,
 Superintendent of the ship's shop _____ 4-6,
 Chief mates (political assistants) _____ 5-8,
 Radio operators _____ 4-6.

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